

**REMARKS**

Claims 1-31 and 33-38 are pending after entry of this paper. Claims 1-38 have been rejected.

Claims 1 and 28 have been amended. Claim 28 has been amended to incorporate the subject matter of cancelled claim 32. No new matter has been introduced by these amendments.

Reconsideration and withdrawal of the rejections in view of the above claim amendments and below remarks are respectfully requested.

**Response to Rejections Under 35 U.S.C. §112**

The Examiner has rejected claim 1 under 35 U.S.C. §112 for allegedly being indefinite, specifically with respect to the terms “introduced from below” and “preferably central gas supply tube.” Applicants have amended claim 1 to cancel the phrase “preferably central.” Accordingly, applicants believe the rejection to be moot, and respectfully request withdrawal of same.

**Response to Rejections Under 35 U.S.C. §103(a)**

The Examiner has rejected claims 1, 2-30, 32-34, and 36-38 under 35 U.S.C. §103(a) as allegedly being obvious over Australian Patent No. AU 9894057 A (“Formanek”) in view of U.S. Patent No. 5,505,907 (“Hiltunen”) and any one of U.S. Patent Nos. 4,817,563 (“Beisswenger”), 4,080,437 (“Reh”), or 4,402,754 (“Schmidt”). The Examiner has presented a brief description of each of the cited references, and has gone on to address each claim or set of

claims individually. Applicants address the rejections as they pertain to the independent claims 1 and 28.

Regarding claim 1, the Examiner specifically contends that it would have been obvious to incorporate the reactor design of Hiltunen and the particle Froude number control of any of Beisswenger, Reh, or Schmidt ("the three references") into the titanium ore (ilmenite) reduction process of Formanek (page 5 of the Office Action). The Examiner contends that one would be motivated to incorporate the reactor design of Hiltunen because of the alleged teaching of reduced fouling and improved heat exchange, and that one would be motivated to use the Froude numbers of the three references because all three teach Froude numbers as well-known means of controlling fluidized beds. Applicants do not agree that the invention as recited in claim 1 is obvious over these cited references.

The Examiner has cited Formanek for the general process of treating ilmenite. The Examiner acknowledges that Formanek fails to teach any of the elements of the annular fluidized bed as recited in instant claim 1.

The Examiner describes the reactor **10** of Hiltunen as having an annular chamber **12** with a fluidized bed **14** and a central gas supply tube **16** surrounded by the fluidized bed. The Examiner contends that in Hiltunen particles from the bed overflow over edges **18** into the tube and alleges that they entrained in the hot gas supply.

The purpose of the method of Hiltunen is to cool hot gas (abstract) by contacting it with large amounts of cool solid particles from the fluidized bed. The gas containing the particles is conveyed through the riser **22** into the upper section of the reactor where solid particles are separated from the gas in a particle separator and returned to the outer parts of the fluidized bed via return duct **36**. Hiltunen, as the Examiner implicitly admits, is completely

silent as to controlling particle Froude numbers. Indeed, particle Froude numbers are not mentioned at all in Hiltunen, primarily because there is no need to adjust the flow characteristics of particles in this context, as mass and heat transfer within the riser **22** does not need to be optimized to accomplish the objective of Hiltunen (*i.e.*, to cool the hot gas). The particles do not have to be heated up to a uniform temperature in Hiltunen, as it is sufficient for the particles merely to absorb heat from the gas to accomplish the objective. The particles will afterwards be cooled by heat transfer means in the return duct **36** and fluidized bed **14**.

The method as recited in claim 1 is described in the specification at page 3, lines 25-30 (emphasis added):

When passing through the upper region of the central tube, the first gas or gas mixture entrains solids from the annular stationary fluidized bed...into the mixing chamber, so that, due to the high speed differences between the solids and the first gas, an intensively mixed suspension is formed and an optimum heat and mass transfer between the two phases is achieved.

As the Examiner is well aware, the claims must be interpreted in light of the specification. With respect to claim 1, the specification makes clear the adjusting the particle Froude numbers to a particular value is necessary in order to achieve the intensively mixed suspension and optimum heat and mass transfer between the two phases. The development of such an intensively mixed suspension in the reactor of Hiltunen is not possible. Furthermore, there is no teaching, suggestion, or motivation in Hiltunen that would lead one of ordinary skill in the art to desire to control the fluidized bed, as the Examiner contends, let alone to look to particle Froude numbers to do so in the method of Hiltunen.

The Examiner contends that one of ordinary skill in the art would look to particle Froude numbers as allegedly disclosed in the three references because “all three teach the Froude numbers as well-known means of controlling fluidized beds.” Regardless of the specific

teachings of the three references, this rationale does not support a *prima facie* case of obviousness. Merely because one could control fluidized beds using Froude numbers does not necessarily mean that one of ordinary skill in the art would choose to do so. There must be some teaching, suggestion, or motivation, either within Hiltunen itself, or within the art in general, that would lead one of ordinary skill in the art to desire to control the fluidized bed. As discussed above, there is no such disclosure in Hiltunen. Indeed, the very purpose of Hiltunen, namely to cool hot gas, implicitly teaches away from controlling the fluidized bed by particle Froude numbers, because of the lack of necessity to control or optimize the heat and mass transfer to successfully accomplish this objective. Accordingly, applicants respectfully assert that the rationale for modifying the method of Hiltunen with the particle Froude numbers of the three references does not properly support a *prima facie* case of obviousness (see MPEP §2141).

Furthermore, assuming *arguendo* that a motivation to modify Hiltunen to control the fluidized bed exists, one of ordinary skill in the art would not look to the three references, or the particle Froude numbers disclosed therein, to do so because the three references disclose traditional circulating fluidized bed reactors, not a stationary annular fluidized bed reactor as recited in claim 1. Each of the three references discloses a range of Froude numbers that are obtained in the fluidized bed when the respective processes are operated at the circulating fluidized bed reaction conditions disclosed in each of the three references. In contrast, claim 1 requires adjusting particle Froude numbers to particular ranges in the gas supply tube, annular fluidized bed, and mixing chamber, sections not present in the reactors of the three references. The Froude numbers disclosed in the three references pertain only to the reaction conditions in the circulating fluidized bed and not to the enablement of the transport of solid particles. Accordingly, one of ordinary skill in the art reading Hiltunen and the three references would not

be motivated to adjust particle Froude numbers in the reactor of Hiltunen to arrive at the invention as claimed in claim 1. Applicants therefore respectfully request reconsideration and withdrawal of the rejection of claim 1 under 35 U.S.C. §103(a).

Regarding independent claim 28, the Examiner merely contends that “the method of claim 1 that was rejected above included all of these features.” Applicants respectfully submit that claim 28 is thus allowable for at least the reasons set forth above regarding claim 1.

Furthermore, applicants have amended claim 28 to incorporate the subject matter of cancelled claim 32. This amendment has been made voluntarily, and is not in response to the rejection under 35 U.S.C. §103(a). Nevertheless, applicants respectfully submit that amended claim 28 is further distinguishable over the cited references. Specifically, Hiltunen et al. is clear that solid particles from the fluidized bed never leave reactor **10**, and instead are separated from the gas and returned to the fluidized bed within the reactor. In contrast, amended claim 28 requires that the plant include “a solids separator downstream of the reactor, wherein the solids separator comprises a solids conduit leading to the annular fluidized bed of the reactor.” Furthermore, any modification of the reactor of Hiltunen et al. to include a downstream separator would be contrary to the teachings of Hiltunen et al. Specifically, Hiltunen et al. is directed to an apparatus for the treatment of gas, in which the solid particles of the fluidized bed remain within the reactor, while only purified and cooled gases leave the reactor (see, *e.g.*, col. 4, lines 45-53). Thus, modification of the reactor of Hiltunen et al. to include an external separator would be a illogical and contradictory to the express teachings of Hiltunen et al.

Accordingly, applicants respectfully request reconsideration and withdrawal of the rejection of claim 28 under 35 U.S.C. §103(a).

The Examiner has rejected claim 31 under 35 U.S.C. §103(a) over Formanek in view of Hiltunen and any one of the three references, as above, and in further view of U.S. Patent No. 3,578,798 ("Lapple"). The Examiner applies Lapple only for the alleged teaching of the gas distributor plate design. In the first instance, applicants respectfully submit that claim 31, which depends from claim 28, is allowable for at least the reasons set forth above regarding claims 28 and 1. Furthermore, applicants note that the instantly claimed invention was adequately distinguished over Lapple in the May 5, 2008 Amendment and Response to Restriction Requirement. Applicants therefore respectfully request reconsideration and withdrawal of the rejection of claim 31 under 35 U.S.C. §103(a).

The Examiner has rejected claim 35 under 35 U.S.C. §103(a) over Formanek in view of Hiltunen and any one of the three references, as above, and in further view of International Publication No. WO 90/11824 ("Engstrom"). The Examiner applies Engstrom only for the alleged teaching of the fuel lance arrangement of claim 35. Regardless of the whether or not the fuel lance arrangement of claim 35 is taught by Engstrom, applicants submit that claim 35, which depends from independent claim 28, is allowable for at least the reasons set forth above regarding claims 28 and 1. Accordingly, applicants respectfully request reconsideration and withdrawal of the rejection of claim 35 under 35 U.S.C. §103(a).

#### Dependent Claims

Applicants have not independently addressed all of the rejections of the dependent claims. Applicants submit that for at least similar reasons as to why independent claims 1 and 28 from which all of the dependent claims 2-27, 29-31, and 33-38 depend are believed to be

allowable over the prior art as discussed *supra*, the dependent claims are also believed to be allowable. Applicants reserve the right to address individual rejections to dependent claims at a future time should it be deemed necessary or appropriate.

Response to Provisional Non-Statutory Double Patenting Rejection

The Examiner has provisionally rejected claims 1-5 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over each of claims 1-6 of copending Application No. 10/540,352 (US 2006/0230879), claims 1-5 of copending Application No. 10/540,434 (US 2006/0230880), claims 1-5 of copending Application No. 10/540,435 (US 2007/0137435), claims 1-5 of copending Application No. 10/540,436 (US 2006/0231466), and claims 1-5 of copending Application No. 10/540,438 (US 2006/0249100). Since the conflicting claims have not in fact been patented, this is a provisional obviousness-type double patenting rejection.

In response, applicants respectfully request that the provisional double-patenting rejection be held in abeyance due to the provisional nature of the rejection until one of the applications is allowed. Upon notice of otherwise allowable subject matter, applicants will address the rejection. Applicants note that it is proper when dealing with otherwise allowable subject matter in co-pending applications to withdraw a provisional rejection in the most advanced application, allow it to issue, and make a (non-provisional) rejection in the remaining application.

Applicants note that Application No. 10/540,438 (US 2006/0249100) was allowed on April 24, 2008, and the Issue Fee was timely paid on July 24, 2008. Therefore, in the interest of advancing prosecution of the instant application, applicants provide herewith a terminal

disclaimer which obviates the obviousness-type double patenting rejection that could properly be made upon issuance of a patent from Application No. 10/540,438. Withdrawal of the rejection is respectfully requested.

### **CONCLUSION**

Based on the foregoing amendments and remarks, the applicant respectfully requests reconsideration and withdrawal of the election requirement of claims and allowance of this application. In the event that a telephone conference would be helpful in advancing prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number provided.



**AUTHORIZATION**

The Commissioner is hereby authorized to charge any additional fees which may be required for consideration of this Amendment to Deposit Account No. **13-4500**, Order No. 4791-4015.

Applicants believe this paper to be timely filed. In the event that an extension of time is required, or which may be required in addition to that requested in a petition for an extension of time, the Commissioner is requested to grant a petition for that extension of time which is required to make this response timely and is hereby authorized to charge any fee for such an extension of time or credit any overpayment for an extension of time to Deposit Account No. **13-4500**, Order No. 4791-4015.

Respectfully submitted,  
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